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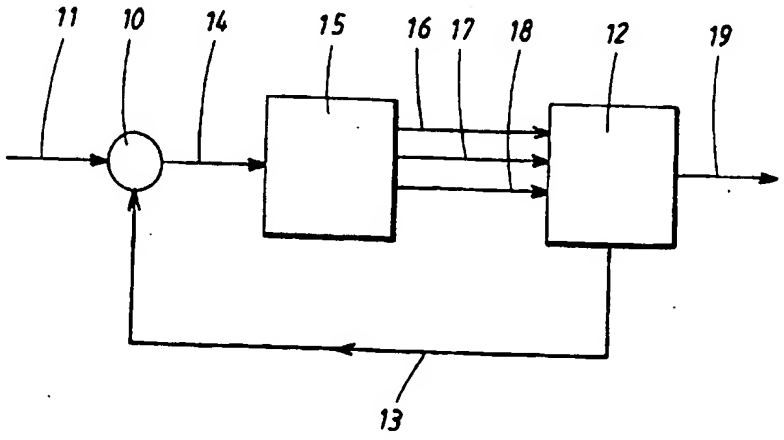

(57) Abstract

The invention relates to a method for controlling the beating in a refiner. This is characterized in that, in order to influence the different quality parameters for the beaten mass, the applied pressure on the beating discs in the refiner, the feed flow of the chips and the nozzle water are regulated by means of values from measured pressures and temperatures in the beating zone. The invention also includes an arrangement for performing the method according to the invention.

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METHOD FOR GUIDING THE BEATING IN A REFINER AND ARRANGEMENT FOR PERFORMING THE METHOD.

TECHNICAL FIELD:

The present invention relates to a method for controlling the beating in a refiner which beats wood chips in a water suspension to produce a cellulose mass for paper production. The invention also relates to fine grinding of already beaten mass in a further refiner intended for fine grinding of the mass.

PRIOR ART:

It has long time been common practice to beat chips of wood in a refiner to produce mass which is then to be processed into paper or paper products. Refiners, which are often called beaters or pulpers, are used for beating different types of cellulose mass which may contain or be freed from lignin.

There are in principal two different types of refiners, namely so-called conical refiners and disc refiners. In the former, a cone having knives on the surface rotates and it is surrounded by a corresponding conically-shaped mantle which is also provided with knives, but on the inner side. Chips in water suspension are allowed to flow from the narrow end of the cone to its wider end while the cone rotates and they are thereby beaten in the existing beating gap.

Disc refiners are possibly more commonly used and they consist principally of a stationary disc against which a corresponding disc rotates with a certain play. So-called twin refiners may also be used and in these stationary discs are arranged at either side of the rotating disc. Also so-called double-rotating or counter-rotating disc refiners are used where both beating discs rotate in

counter direction to each other and the material to be ground is introduced through the centre of one of the discs, which is provided with spokes. Those surfaces of the discs which are facing each other are provided with knives. The material to be ground is introduced in the central part and is conveyed out towards the periphery during the beating. To obtain efficient beating, the discs must be pressed against each other and one of the beating discs, preferably the stationary one, is therefore provided with pressure arrangements, preferably of a hydraulic type, on one side so that it can be pressed against the rotating disc. The resulting pressure which is suitable for, for example, beating chips is up to a few bars, for example 6 bars and the temperature is, in such a case, 170°-180°C. This means that the water is at boiling point and saturated steam is preferably created to some extent. It is also possible to beat at higher temperatures, whereby super-heated steam is created.

The process which occurs in a disc beater is schematically illustrated in Fig. 1. This figure shows in section a stationary grinding disc 1 against which a rotating grinding disc 2 is pressed using a suitable pressure. The material to be ground 3 arrives at the centre and is conveyed outwardly against the periphery past the arrows shown.

The temperature of the material that is beaten rises from the centre and outwardly towards the periphery. This occurs as a matter of course, due to the inner friction between the beating discs and the chips/mass suspension introduced. This friction is small at the centre where the grinding discs have a small periphery velocity and a large beating play, but it rises outwardly with rising peripheral velocity of the grinding disc 2 and decreased grinding play. It has therefore always been believed that the

highest temperature is obtained closer to the periphery part of the beating discs at an area which is denoted as 4 in the Figure. However, it has been shown that the maximal temperature is in the area which is marked with 5 for refiners which are fed with chips and centred to 6 for refiners which are fed with pulp, i.e. substantially further towards the centre.

Fig. 2 shows two curves for the temperature depending on the radius from the centre of the beating discs. The curve 1 has been drafted for a maximum pressure of 6 bars between the beating discs 1 and 2 corresponding to a highest temperature of 170°-180°C, the so-called pressure peak, which in this case is near the centre. The curve 2 has been drafted for a pulp refiner and the pressure peak, and accordingly the temperature peak, have in this case been displaced to the right, i.e. closer to the periphery of the grinding discs. The curve 2 relates primarily to a beating material which has been beaten earlier and the pattern of the beating discs is therefore somewhat finer.

TECHNICAL PROBLEM:

The above is an example of the fact that the beating conditions in a refiner can be very different. These conditions influence the different quality parameters of the finished beaten pulp, or the paper which is produced from this pulp. Accordingly, there is a very great need to be able to influence the beating operation so that the desired quality parameters can be obtained. The physical properties which influence the beating conditions are the pressure in the beating zone, the temperature in the beating zone and the concentration of chips and fibres. If the quality parameters are to be influenced, these physical conditions must accordingly be controlled, i.e. the feed of chips, water and the temperature of the water and the pressure, i.e. the hydraulic pressure which is applied

against one of the beating discs. Noone has hitherto been able to predict how these factors cooperate and how they can be regulated for a desired quality result.

SOLUTION:

It has therefore long been a desire to be able to control the quality of the beaten pulp and keep the beating process constant so that a desired pulp is continuously obtained and, according to the invention, a method has therefore been obtained for controlling the beating in a refiner, whereby, in order to influence the different quality parameters for the beaten mass, the applied pressure on the beating discs in the refiner, the feed of chips and the nozzle water and possibly the steam pressure are regulated by means of values from the measured pressures and temperature in the beating zone, which method is characterized in that, in the event of sinking or rising values of the quality parameters, such as dewatering ability (CSF), fibre length (FL), fibre width (FB), shives (SHIVES), tear resistance (RIV), of the beaten mass or of the paper produced therefrom, the temperature in the beating zone is lowered or raised and when parameters, such as light dissipation (LJSP) and tensile strength, fall or rise, the temperature in the beating zone is raised or lowered respectively.

The expression "nozzle water" denotes the water which is added through a nozzle to the chips to make a chip suspension.

According to the invention, the temperature is regulated in the beating zone by means of the applied pressure, the feed of chips or nozzle water or a combination of these values.

According to the invention, these measured values (ACTUAL VALUES) of the pressure and the temperature are fed into a

computer unit, into which the desired values (DESIRED VALUES) are fed, wherefrom deviations from the desired values are fed into a control unit which regulates the applied pressure on the beating discs in the refiner, the feed of chips or water to this and possibly the vapour pressure.

The invention also includes an arrangement for performing the method, which arrangement is characterized by a refiner having temperature and pressure gauges in the beating zone, a computer containing the (DESIRED VALUES) for pressures and temperatures in the beating zone arranged to continuously be fed with the measured (ACTUAL VALUES) pressures and the temperatures in the beating zone and to forward the difference of the (ACTUAL and DESIRED VALUES) to a steering unit for steering the applied pressure on the beating discs in the refiner and/or the feed flow thereto of chips, pulp and water and possibly the vapour pressure.

Fig. 3 shows schematically the controlling of the process. The unit 10, which is a computer or similar electronic equipment, is fed with the desired values 11, which are stored in this unit 10. From the process 12, intermittently and with a high sampling speed, the measured pressures and temperatures are fed into this computer 10 and the difference between these values (ACTUAL VALUES and DESIRED VALUEs) 14 is fed into the control unit 15 which controls the hydraulic pressure 16, the chip flow 17 and/or the nozzle water amount. The temperature in the process 12 can also be influenced by the nozzle water temperature, but it is generally kept constant and is regulated in a suitable way by heating before the water is fed into the process. The beaten mass is taken out from the process at 19.

The method according to the invention is not limited to any given arrangement for gauging pressures and temperatures in

the beating zone. Such arrangements are, however, known through, for example, the Swedish patent application 9403743-9. Through this arrangement, measurements of pressures and temperature can be made within intervals of milliseconds, if so desired. This means that it is possible to cover the time constants that are of interest which occur in refiners, namely 0,3-0,9 seconds. With earlier techniques it has not been possible to carry out such rapid measurements and, accordingly, it has not been possible to control the refiners. By measuring along the radius of the beating discs, it is possible to obtain a time- and space-separated information which can be used for controlling the quality of the mass.

The actual idea with the present invention is to keep the temperature and/or pressure curves constant during the time and thereby minimise the variations. This can be done by coupling the information for these measures to one or more of the control variables which are mentioned above, namely the speed of the feeding screw for the chip flow, the flow of the dosing water to the refiner and the hydraulic pressure which regulates the distance of the beating discs from each other.

If so-called "twin refiners" are used, the distribution between the feeding screws can come into question, but the principal with the above-mentioned parameters is fully valid. The invention is also usable for so-called double disc refiners and cone refiners in which the beating discs are cones.

By measuring the pressure and temperature along the radius, the time that the fibre remains in the refiner can also be calculated. Moreover, the speed curve for the vapour can be divided and the time that the mass is present up to the so-called pressure peak as well as the time that the mass is

present from the pressure peak to the periphery can be calculated. This means that a relative measure can be created which, together with the total integral for the mass flow through the refiner, can give information about how the refining of the chips (mass) occurs. By means of the present invention it has accordingly been established how to use the temperature and pressure curves directly in order relate them to the quality of the mass.

By measuring according to the present invention, information on possible vibrations and pulsations in the refiner may also be obtained. Vibrations may arise in different ways, for example by damaging a bearing, or pulsations may arise due to the fact that the discs of the refiner are not completely parallel on the inner side, so that a pumping effect is created. With the measuring according to the present invention these phenomena can thus be dealt with.

The invention is not limited to the embodiment example shown but can be varied in different ways within the scope of the claims.

CLAIMS:

1. Method for controlling the beating in a refiner whereby, in order to influence the different quality parameters for the beaten mass, the applied pressur . the beating discs in the refiner, the feeding of the flow of chips and the nozzle water and possibly the vapour are regulated by means of values from pressures and temperatures measured in the beating zone, c h a r a c t e r i z e d i n that in the event of sinking or rising values of the quality parameters, such as dewatering ability (CSF), fibre length (FL), fibre width (FB), shives (SHIVES), tear resistance (RIV), of the beaten mass or of the paper produced therefrom, the temperature in the beating zone is lowered or raised and when parameters, such as light dissipation (LJSP) and tensile strength, fall or rise, the temperature in the beating zone is raised or lowered respectively.

2. Method according to claim 1, c h a r a c t e r i z e d i n that the temperature in the beating zone is regulated by means of the pressure, the feed flow of chips or nozzle water, or a combination of these.

3. Method according to claim 1 or 2, c h a r a c t e r i z e d i n that the measured values, (ACTUAL VALUES) of the pressure and the temperature are fed into a computer unit where the desired values (DESIRED VALUES) are stored, from where the variations from the (DESIRED VALUES) are fed into a control unit which regulates the applied pressure on the beating discs in the refiner and the feed flow of chips and/or water to the refiner and possibly steam pressure.

4. Arrangement for performing the method according to any of claims 1-3, c h a r a c t e r i z e d by a refiner having temperature and pressure gauges in the beating zone, a computer containing the (DESIRED VALUES) for pressures and temperature in the beating zone arranged to continuously be fed with the measured (ACTUAL VALUES) pressures and temperatures in the beating zone and to forward the difference in the (ACTUAL and DESIRED VALUES) to a controlling unit for controlling the applied pressure to the beating discs in the refiner and the feed flow to the refiner of chips, mass and water and possibly the steam pressure.

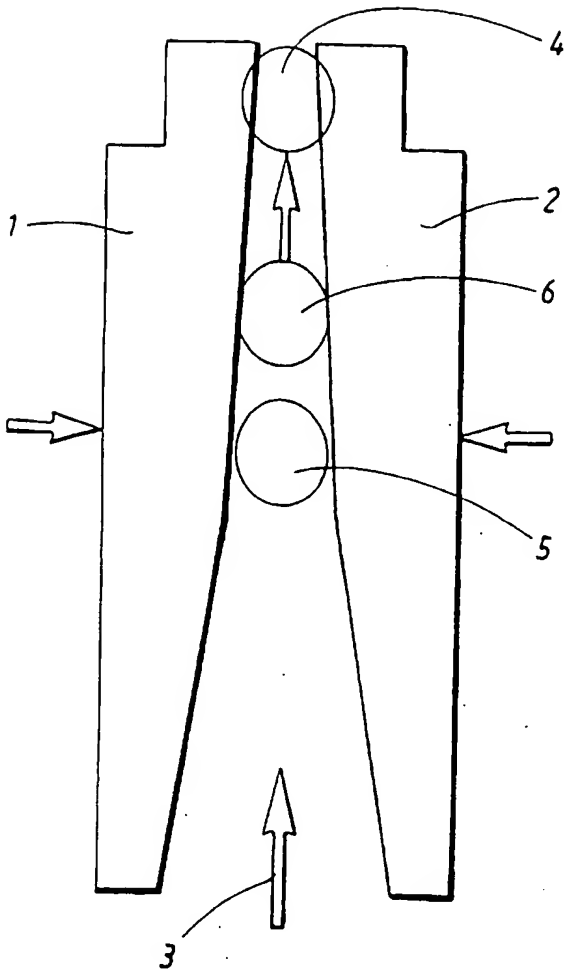

FIG. 1

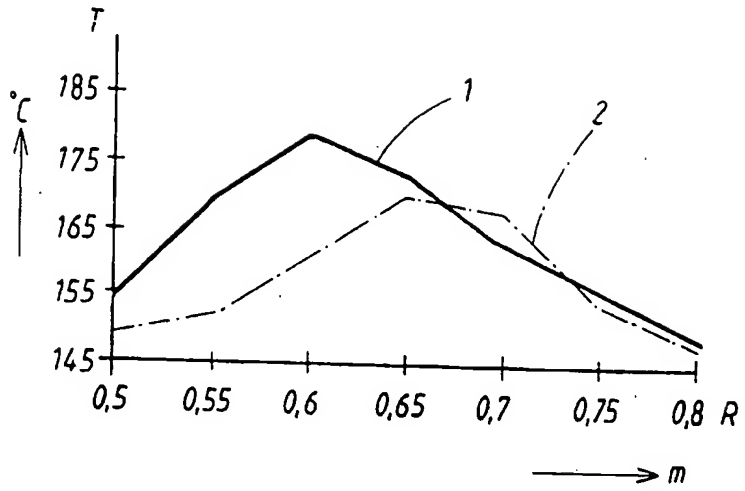
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FIG.2

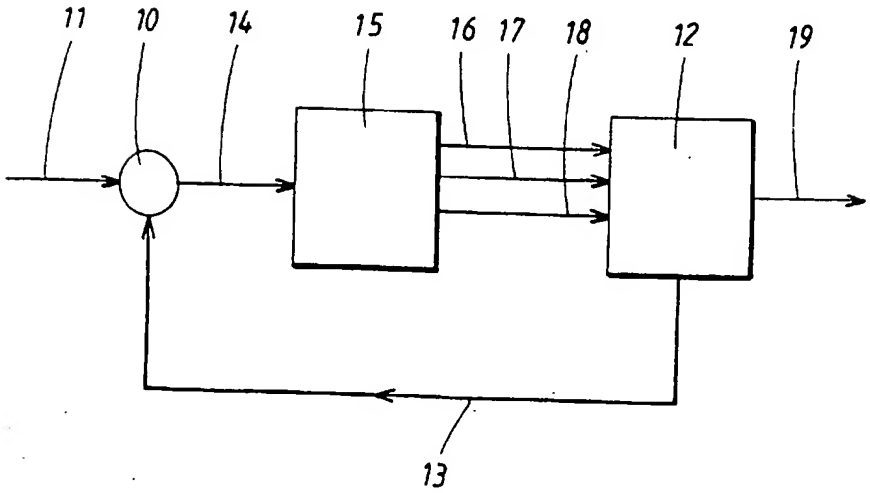
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FIG.3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 97/00577

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B02C 7/14, D21B 1/14, D21D 1/30
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B02C, D21B, D21D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SE 407952 B (DEFIBRATOR AB), 30 April 1979 (30.04.79), page 3, line 5 - line 21, figures 1-4 -- --------	1-4

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
SE 407952 B	30/04/79	BR 7700559 A	04/10/77
		CA 1053050 A	24/04/79
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